Early recognition, management and outcome of a large subgaleal hemorrhage in a neonate at birth

BY VINAYAK NADAR, MD, AND ASHAJYOTHI M SIDDAPPA, MD

A 30-year-old mother was admitted in active labor at 37 weeks of gestation. Her pregnancy was uncomplicated; she had her first prenatal visit at six weeks gestation and her lab work was within normal limits. Her labor was prolonged and there was fetal bradycardia, but the family was undecided about C-section, so vacuum instrumentation was attempted. The fetal heart rate decelerations continued, with a failed vacuum attempt and concern for shoulder dystocia, so a decision was made to deliver by STAT C-section. The newborn intensive care unit (NICU) team was notified and present at time of delivery. The infant was resuscitated with intubation in the delivery room and transferred to NICU for further management.

At admission, the infant’s hemoglobin was 13.4 gm/dL, but dropped to 6 gm/dL within a few hours; severe subgaleal bleeding was noted on exam. The infant was resuscitated aggressively with multiple boluses of fresh frozen plasma, cryoprecipitate, and packed red cell transfusions to correct coagulopathy and hypotension. Skull X-ray and cranial ultrasound findings were consistent with a very large subgaleal hemorrhage (SGH). CT scan of the brain revealed a right frontal bone fracture, large amounts of blood in subgaleal space with relatively small subarachnoid and subdural hemorrhages. On the second day of life, the infant had seizure activity that was treated with levetiracetam (Keppra). By the third day of life, the infant remained hemodynamically stable with reduced swelling and edema around the occiput and neck. An MRI of the brain showed intraparenchymal, subarachnoid hemorrhage involving the right cortex and concern for acute infarctions involving similar distribution in right parietal/temporal/frontal regions and corpus callosum, SGH. The patient continued to improve without seizure activity, with progressive resolution of neck edema/swelling. The parents were updated on the guarded prognosis and the high risk for long-term neuro-developmental problems.

Bilirubin peaked at 7.1/0.8, then trended down thereafter. An EEG was mildly abnormal with excessive sharp activity, which was nonspecific for seizures and indicated mild diffuse cerebral dysfunction. The infant was discharged 13 days after birth in a stable condition. The discharge physical exam was notable for...

Neonatal complications associated with vacuum-extraction deliveries

- Scalp Injuries, bruising, hematoma
- Large caput succedaneum
- Subgaleal hemorrhage
- Cephalhematoma
- Intracranial hemorrhage (subdural, subarchanoid, intraventricular and cerebral)
- Skull fracture
- Seizures
- Anemia
- Severe/persistent metabolic acidosis
- Shock
- DIC
- Hyperbilirubinemia
- Shoulder dystocia
- Clavicle fracture
- Brachial plexus Injury
- Retinal hemorrhage
- Subconjunctival hemorrhage
- Fetal/Neonatal death
showing a resolving subgaleal hematoma with minimal bruising over the eyelids and occiput, and grossly normal neurological examination. The infant went home breastfeeding successfully and was discharged on Keppra for seizure prophylaxis, with a plan for repeat EEG and MRI brain and close follow-up with a pediatric neurologist, NICU follow-up clinic, and occupational and physiotherapist and pediatric hematology. At 24 months old, she continues to do well; her growth and development are good and she shows no significant neurological deficits.

SGH occurring during the neonatal period is a rare complication, but it is important for all medical staff working with neonates to remember that even though it is rare, it is associated with significant mortality, 12–25%, when not recognized. It was first reported by Naegele in 1819 and later was cited by Virchow in 1863.  It was initially named “false cephalohematoma,” then was renamed by Malmstrom in 1957 as “subgaleal hemorrhage,” when he first introduced the vacuum extractor.

Anatomically, the scalp has five layers. From top to bottom, the layers are skin, dense connective tissue, galea aponeurotica, loose connective tissue, and perios teum. SGH occurs in the loose connective tissue underneath the galea aponeurotica. This area has many emissary veins which connect the intradural venous system with superficial scalp veins. These veins are torn when shear trac tional force is applied to the skin over the scalp. Bleeding occurs in the potential space between the galea aponeurotica and the periosteum of the skull. Subgaleal space extends from the orbital ridge to the nape of the neck, and can accommodate a large amount of blood—up to several hundred milliliters in a neonate (50–80% of the blood volume).

Over the past three decades, however, there has been a drastic decrease in instrument deliveries in conjunction with an increase in C-sections for difficult deliveries. Instrument-assisted deliveries are associated with an increased risk of birth trauma (Table 1). Vacuum extraction is used when the second stage of labor is prolonged, when the mother is unable to push effectively, or when there is non-reassuring fetal heart rate so that shortening the second stage of labor is necessary. Vacuum extraction is used successfully most of the time, but difficult vacuum extractions are associated with neonatal complications. Difficult vacuum extractions could include cup dislodgements, more than three extractions, or a total duration exceeding 15–20 minutes.

Subgaleal hemorrhage is a rare complication following vacuum-extraction delivery, but there are case reports of SGH occurring following caesarian section and even with spontaneous vaginal delivery. Incidence is 0.1–0.6/1000 of all deliveries and is 3–7.6/1000 following vacuum-assisted births. Vacuum use is reported in 49% of all instances of subgaleal hemorrhage. Bleeding is gradual and may not be apparent right away after delivery; bleeding may occur over several hours. A large SGH could be confused with large caput or cephalhematoma (Fig.1). SGH usually presents as a boggy, fluctuant swelling. Mainly accumulating in dependent areas, in severe cases it can cause elevation and displacement of ear lobes and puffiness of the eyes. When not recognized in time, massive subgaleal hemorrhage can lead to hypovolemic shock, DIC, persistent metabolic acidosis, and death, despite volume resuscitation.

Management of SGH includes a prompt initial assessment by an experienced staff, pediatrician, or neonatologist, with careful examination of scalp in an infant born after a vacuum delivery or if the delivery has been difficult. Monitoring hemoglobin/hematocrit and measuring head circumference around the clock during initial period is critical. Diagnosis can be confirmed by MRI/CT scan/head ultrasound once infant is medically stable (Fig.2). If SGH is seen following a non-traumatic delivery, a coagulation screen should be considered to rule out bleeding disorders. Treatment per se is related to blood loss: aggressive fluid boluses/blood transfusion to treat hypotension, coagulopathy with fresh frozen plasma. Recombinant activated factor VII has been used.
in some cases to stop hemorrhage in infants where hemorrhage is not controlled with FFP and platelet transfusion. More severe cases may include cerebral involvement with seizures that require treatment and neurology involvement, or intracranial extension that requires neurosurgery evaluation. Monitoring for hyperbilirubinemia is important during resolution of a large subgaleal bleed, as some infants will require phototherapy. Once bleeding is controlled, the swelling generally resolves over weeks and there is a good prognosis, but it is prudent to have close neurology follow-up to identify and evaluate for any residual neurological deficits during the first year of life. Poor neurodevelopmental outcomes are seen with severe SGH.9

SGH is an important cause of preventable morbidity and mortality in newborn infants. It is important to educate healthcare workers involved in caring for newborn infants regarding complications following instrumental delivery. Given the insidious nature of bleeding from such deliveries, increased awareness on identifying SGH is important. Though SGH is a rare complication, early recognition, careful monitoring, and prompt treatment is critical for improving survival and outcomes.

Vinayak Nadar, MD, is a resident in the Department of Anesthesia at the University of Minnesota. Ashajyothi M. Siddappa, MD, is a neonatologist in the Department of Pediatrics at Hennepin County Medical Center.

REFERENCES
5 Murphy DJ, Liebling RE, Patel R. Cohort study of operative delivery in the second stage of labour and standard of obstetric care. BJOG 2003; 110:610–15